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BRINGING TECHNICAL AUTHORING SKILLS TO LIFE FOR STUDENTS THROUGH AN EMPLOYER AUDIENCE

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ABSTRACT

It is crucial that students in the computing area are equipped with strong research and technical authoring skills and expertise. These are transferable life long skills which are sometimes difficult to develop and can be viewed as 'dull' by the students. This study explores a more authentic and lively approach to delivering and assessing a module on technical authoring to undergraduate computing students. Students were asked to produce work for presentation at a conference aimed at external participants mainly from local industry and business. This challenged the students in terms of their technical authoring skills and brought a professionalism and realism to the module. There were other less obvious benefits from this approach. Students gained in confidence through the work they presented but also through being 'delegates' at the conference and engaging in the question and answer sessions. Student feedback on the module was positive and constructive and their assessment work was of a high standard.

Keywords

Authentic assessment, student engagement, personal development, professional development, technical authoring, employer engagement, lifelong learning.

1. INTRODUCTION

This study sets out to engage a group of computer networking students in a more authentic way in their development of technical authoring skills. Feedback from previous cohorts and academic tutors indicates that both staff and students realise the benefits of developing these key skills and the valuable contribution they can make for personal, professional and academic development. However student feedback has also indicated that students felt the delivery of these skills within a specific module lacked interest.

To address these issues, a small scale action research project was undertaken by the module team, with the aim of providing a more authentic and engaging module delivery and assessment process. A conference aimed at employers was used as the main vehicle for achieving this by providing a focus for the assessment process.

This paper reports on the results of this study. First the need for authentic and engaging student activities is justified through a critical review of the literature. The details of the student cohort and technical authoring module are presented. Finally the outcomes from this approach are discussed and evaluated highlighting the positive and constructive feedback received from students and areas for further development.

2. THE NEED FOR AUTHENTIC AND ENGAGING MODULE DELIVERY AND ASSESSMENT

2.1 The Need for an Active Learning Approach

The philosophy underlying active learning can be seen in this quote attributed to Confucius, Chinese Philosopher and reformer (551BC – 479BC) “*I hear and I forget. I see and I remember. I do and I understand*”. There is strong evidence that active learning can lead to higher level learning (Prince, 2004; Felder and Brent, 2009). Active Learning is “*generally defined as any instructional method that engages students in the learning*

process. In short, active learning requires students to do meaningful learning activities and think about what they are doing" (Bonwell and Eison, 1991).

The Boyer Commission through its two reports "*Reinventing Undergraduates Education: A Blueprint for America's Research Universities*," (Boyer, 1998) and "*Reinventing Undergraduate Education: Three Years after the Boyer Report*" (Boyer, 2002) reinforced the need for active learning. Based on a quote from the famous education reformer and psychologist, John Dewey from the early nineteenth century, the Boyer commission emphasise that "*Learning is based on discovery guided by mentoring rather than the transmission of information*" (Boyer, 1998). The Association of American Colleges and Universities in its document '*Greater Expectations – A New Vision for Learning as a Nation Goes to College*', called for a teaching-learning paradigm shift that would ensure active, empowered, informed, and responsible learners (AACU, 2002).

It is interesting to note that it is only in recent years that higher education institutions have committed to training new academic staff in learning and teaching. Previously it has been assumed that academic staff would be able to teach with no specific training or help. This is in sharp contrast to the way academic staff approach their own subject research. In this latter case, academic staff use the literature and previous studies to inform their practice and find techniques and approaches that are appropriate and effective. Although there is literature on how to teach effectively and on how people learn (Handelsman et al, 2004; Race, 2010), there is still a reluctance for academic staff to engage in this process. As Wood (2004) comments "*medical people are now encouraged to carry out 'evidence-based medicine', so why do we not carry out 'evidence-based teaching'?*" The authors were keen to build on experiences and successful approaches from the literature and ensure that the students were 'learning by doing'. As shown in the Learning Pyramid in Figure 1, students learn more effectively (i.e. 'deep learning' rather than 'shallow learning') if they are active rather than passive during the learning process.

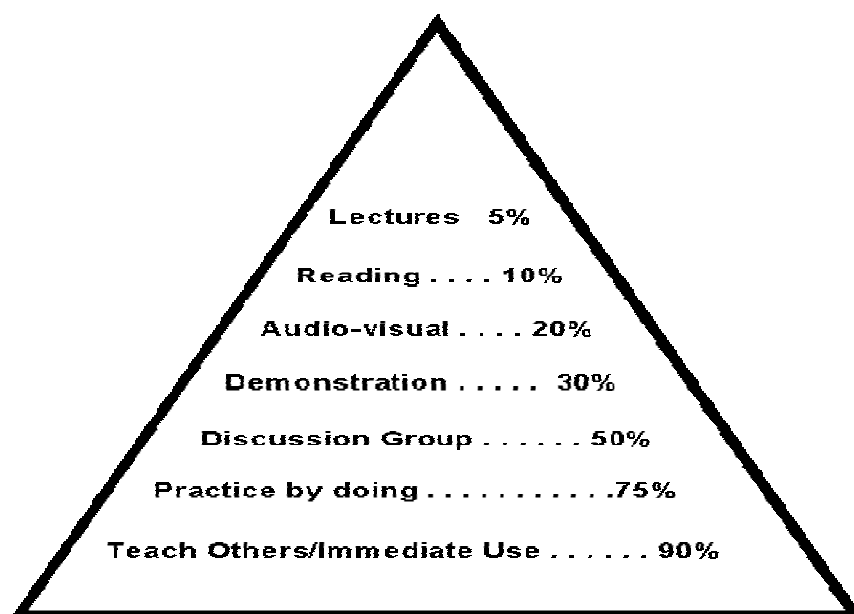


Figure 1: The Learning Pyramid (Wood, 2004)

Please note: The percentages represent the average "retention rate" of information following teaching or activities by the method indicated.

2.2 Authentic Assessment

In addition to providing an active learning approach, the authors were keen to ensure that the assessment process was authentic. According to Mueller (2010), authentic assessment is "*a form of assessment in which students are asked to perform real-world tasks that demonstrate meaningful application of essential knowledge and skills*". Wiggins (1993) describes it as "*...Engaging and worthy problems or questions of importance, in which students must use knowledge to fashion performances effectively and creatively. The tasks are either replicas of or analogous to the kinds of problems faced by adult citizens and consumers or professionals in the field.*"

The justification for providing authentic assessment opportunities is supported by the considerable body of research on learning and teaching that has demonstrated that learners need to be able to construct their own

meaning of the world, using information they have gathered and been taught, and their own experiences with the world (Mueller, 2010). In 2003, the QAAHE (2003) stated that *“The single intervention by universities and colleges that would improve the quality of the student learning experience would be the enhancement of assessment practices”*. However Stefani (2009) observes that assessment practices are still very conservative, commenting that *“We still assess that which is easy to assess rather than the more complex life-long learning skills which are really required of graduates when they enter into employment”*. Changing assessment practices to improve the quality of the student learning experience should be given a higher priority across higher education institutions. Initiatives such as the Assessment for Learning CETL at Northumbria University (Northumbria, 2010) and the Re-Engineering Assessment Practices (REAP) project in Scottish Higher Education (REAP, 2010) are helping to highlight this area of development and provide useful examples and case studies. Both projects provide a set of guiding principles for assessment design. For example the REAP project provides a set of 11 principles for good assessment design building on two basic concepts of ‘empowering’ the learner and ‘engaging’ the learner. This study draws on these assessment principles and those of the Northumbria CETL to inform the design of the assessment for the module.

2.3 Student Engagement

Both active learning and authentic assessment encourage student engagement in their learning. As one student comments *“To be engaged with my studies is to ...understand it and enjoy it and feel a connection between myself and what I am studying, rather than just learning.”* (NSSE, 2006).

3. THE NEED FOR RESEARCH AND TECHNICAL AUTHORING EXPERTISE

The module in this study was introduced into the student programme to provide Level 5 (second year) undergraduate students with technical authoring and research skills and expertise. In recent years, there has been increasing evidence and calls to provide undergraduates with research skills and expertise. A decade ago, the Boyer Commission in the US called on the academic research committee to make *‘research based learning the standard’* (Boyer, 1998; Boyer, 2002). More recently President Obama in his speech to the National Academies of Sciences, called on scientists to use their “love and knowledge of science to spark the same sense of wonder and excitement in a new generation.” He announced additional funds for undergraduate research, demonstrating its importance in preparing the scientists of the future (Obama, 2009).

Since the Boyer commission there have been a number of initiatives in the United States and elsewhere to make undergraduate research a central part of a student’s programme (Hodge et al, 2008; Jenkins and Healey, 2007; Karukstis and Elgren, 2007; Kinkead, 2003; Sheffield Hallam, 2008). According to Walkington and Jenkins (2008), the provision of research opportunities for undergraduate students provides the following main features:

- *“Actively bring undergraduate students into the worlds of research;*
- *Encourage and enable students to learn in ways that parallel or reflect the ways that staff themselves research in their discipline;*
- *Build research opportunities into the formative processes and summative outcomes of course assessment for students in ways that retrace and register how academic staff develop and disseminate their own research in their own discipline or professional area, e.g., through research journals, conferences, exhibitions, recordings and broad/narrow casts.”*

The final year project on many undergraduate programmes provides the opportunity to engage in the research process; however the dissemination of the results from this are often limited to the student, supervisor and assessors. There is rarely an opportunity to disseminate the results and receive feedback and comments from a wider audience. Yet there is increasing evidence of the benefits of such a dissemination process to the student, including greater motivation for the student, development of graduate and employability attributes, and provides a greater understanding of the research process and issues of intellectual identity (Walkington and Jenkins, 2008). Such opportunities are also valued by students in terms of their ability to provide documented evidence for CVs and portfolios and the clear employability benefits this could bring. Walkington and Jenkins (2008) outline ten strategies to facilitate the publication of undergraduate research. Six of these relate closely to the module delivery and assessment strategy outlined in this study.

4. REVISING THE DELIVERY AND ASSESSMENT OF THE TECHNICAL AUTHORING MODULE: AN ACTION RESEARCH APPROACH

The technical authoring module at the centre of this study has been running for a number of years on the computer network technology programme. It was designed to ensure that students can present technical information professionally and in a suitable format, a skill viewed as essential for today’s Information

Technology professional. More specifically the module aims to prepare students to be able to present information on a technical topic in a suitable way for a number of different audiences. The module introduces the student to methods of information retrieval, develops their research skills and enhances their written and oral presentation skills.

4.1 Previous Mode of Delivery and Assessment

The current module team delivered the module last year. The format of classroom delivery was a one hour lecture/seminar each week. This was combined with a series of individual exercises for the students, largely undertaken out of class but with the results brought back to the class for a fuller discussion. Some exercises were prework for the weekly lecture/seminar, providing material that the lecture/seminar could draw on. Other exercises were postwork building on the lecture/seminar material to reinforce specific ideas and concepts and the final set of exercises were to help prepare the students for their final assessment. The final summative assessment was a technical paper and oral presentation at a student conference entitled 'Modern Technological Developments'. This one day conference was organised by the module team and required attendance by all students on the module. Students prepared a working title for their technical paper, then an abstract which were brought together into a conference programme. On the actual day, students gave a presentation on their chosen topic to the other students and submitted a final version of their technical paper.

4.2 Taking an Action Research Approach

The module team had some concerns over the engagement of the students during the module delivery. Although some students were highly motivated, others seemed more disengaged and these students also tended to obtain lower marks in the final assessment. The module team also had concerns over the conference itself. Students listened to each other's presentations but this made it a long day and it was clear that at times the students were unwilling participants in the process and the benefits of being attendees at the conference was not clear to them or the module team.

It was decided that a review of the module was required before the next delivery. Taking an action research based approach (Pickard, 2007), and using the four step cycle defined by Kemmis (see Figure 2), the module team initially reflected on the module delivery to date.

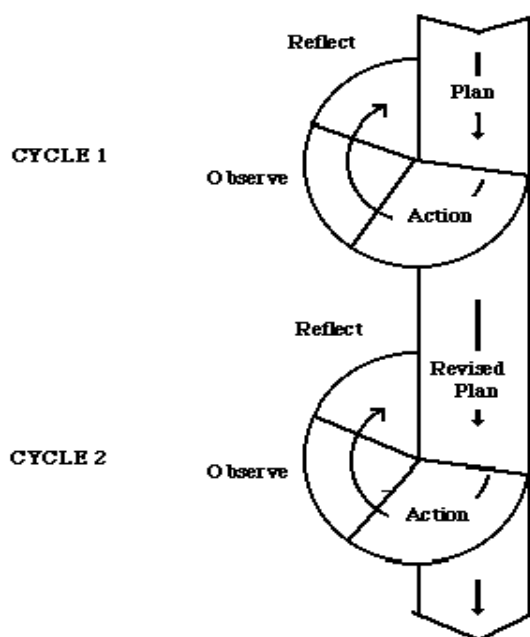


Figure 2: Action Research Protocol after Kemmis (MacIsaac 2010).

Student feedback on the module itself was generally positive and students were positive about the teaching team and they understood the motivation for the module. However comments were also expressed that some of the material was rather 'dry' and 'boring'. The module team were also conscious that too much of the module activities were at the top of the Learning Pyramid (see Figure 1) leading to poor retention of information by students and a lack of student engagement. The conference itself had run on the same broad subject theme for several years and although this provided the opportunity for the current cohort to review titles and abstracts from the previous year, the broad nature of the conference also meant that students

experienced difficulties in selecting a topic and it was challenging to provide a coherence to the conference programme. Finally the module team was conscious that the format of the conference itself needed revising as it was too internally focused around the module and did not provide sufficient motivation for the students.

4.3 Planning for the next Delivery

The next step in the action research cycle is to make plans for some form of intervention. Drawing on previous successful strategies for learning and teaching, the module team identified the following key areas for development:

- a student centred active learning approach to the research-teaching nexus
- an authentic assessment approach

Griffiths (2004) outlines a number of models for the research-teaching nexus. The module team in this study was keen to engage students as participants rather than as an audience leading to a research based approach rather than a research led or research oriented approach. In a research based approach the curriculum is based around inquiry based activities and the division of roles between teacher and student is minimized. This approach also emphasizes the research processes and problems. Jenkins and Healey (2005) introduce a further model to the research-teaching nexus: research tutored. A research-tutored approach is again student centred with students learning in small group discussions with a teacher about research findings with the emphasis on research content. In this study the module team has taken both a research tutored and research based approach ensuring students are engaged actively in the process and that learning is focused on both research content and research process. Six of the ten strategies presented by Walkington and Jenkins (2008) for 'mainstreaming' undergraduate research publication, were identified as providing key benefits for this module. These were:

- build publication into course and programme requirements
- widen what counts as research
- widen the forms of publication
- involve undergraduate students in the publication process
- make the employability benefits of undergraduate research clear to students
- link publication opportunities

In addition the module team were interested in using a more authentic assessment process. Using the eleven assessment principles developed by the REAP project (REAP, 2010) shown in Figure 3, the assessment was modified and designed to both 'empower' and 'engage' the student. These approaches were incorporated into the module delivery and assessment processes.

4.4 Revised Mode of Delivery and Assessment

Following student feedback and identifying the need to engage students in the delivery and take a more authentic approach to the assessment process, the module team reviewed the delivery of the module for the 2009-2010 academic year. This led to the third step in the action research cycle: the intervention (i.e. the *action* in action research) was carried out by changing the module delivery and assessment practice. Firstly the weekly lecture/seminar slot was developed into a more inquiry based session. The content and delivery was adjusted to ensure that any presentation of material using PowerPoint slides or similar, took up less than 50% of this session and even then, the presentation included opportunities for student involvement and engagement. The remaining time in seminars was geared towards student led activities, some requiring preparation outside the class as in previous years, others using a more problem based approach to engage students in their learning and enabling them to take responsibility for their learning. In addition changes were made to the conference and module assessment. Working with colleagues in the computer forensics and information and communication management areas, who also required an outlet for their student work, a conference was set up aimed at external employers from business, industry and the public sector. This conference provided a vehicle for students to present their final assessments from the module, providing a much more authentic assessment opportunity than in previous years. Students were asked to produce a poster for this conference on a technical topic relevant to the conference theme of 'Information Security & Governance: Securing the future for regional businesses'.

<p>Assessment design should:</p> <p>"empower"</p> <ol style="list-style-type: none"> 1. Engage students actively in identifying or formulating criteria 2. Facilitate opportunities for self-assessment and reflection 3. Deliver feedback that helps students self-correct 4. Provide opportunities for feedback dialogue (peer and tutor-student) 5. Encourage positive motivational beliefs and self-esteem 6. Provide opportunities to apply what is learned in new tasks 7. Yield information that teachers can use to help shape teaching <p>"engage"</p> <ol style="list-style-type: none"> 8. Capture sufficient study time and effort in and out of class 9. Distribute students' effort evenly across topics and weeks. 10. Engage students in deep not just shallow learning activity 11. Communicates clear and high expectations to students.

Figure 3: Principles of Good Assessment Design (REAP, 2010)

In terms of the assessment for the module, the REAP good assessment design principles were used as a basis to create a revised assessment strategy, with both formative and summative assessment opportunities. The main summative assessment was a poster presentation at the employer conference on a technical topic. As the audience of external employers could be non-technical specialists such as business managers, the students were given the challenge of providing a poster on a technical topic to a non-technical audience.

In terms of formative assessment opportunities, early on in the module students were asked to identify the title for their module. Feedback was provided on this by the module team in front of other students providing the opportunity for a roundtable discussion of the issues and after this session the title was marked as acceptable/needing revisions/unsuitable, with a further submission date for any revisions/new titles. The next formative assessment task required students to produce an abstract for their poster. These were peer reviewed in one of the weekly sessions followed by a more detailed tutor review, providing written formative feedback. Towards the end of the module, a draft of the conference poster was produced by each student and reviewed by students and the module team in the weekly session, using similar assessment criteria to the final poster.

In addition to the poster, students were required to prepare a 0.5 minute, 2 minute and 5 minute 'verbal tour' of their poster. Again an opportunity was provided for students to practice their 'verbal tours' prior to the conference itself. On the day of the conference, students were expected to dress smartly, attend the whole conference and be available at the refreshment breaks to give 'verbal tours' of their posters. Formal assessment of the poster and their verbal tours were undertaken during the lunch break by the module team and other academic staff.

The relationship of this assessment strategy to the REAP project formative assessment principles is provided in Figure 4. The module team was careful to observe the engagement of students during the module delivery and conference itself. They also ensured that students could provide regular comments on the module itself and there was a formal review point at the end of the module delivery.

Assessment Principle (Source: REAP, 2010)	Key Question for Teachers (Source: REAP, 2010)	Application to Technical Authoring Module
Help clarify what good performance is (goals, criteria, standards)	To what extent do students in your course have opportunities to engage actively with goals, criteria and standards, before,	Formative assessment on draft of poster provided opportunity for students to see and work with criteria used to assess final poster.

	during and after an assessment task?	
Encourage 'time and effort' on challenging learning tasks.	To what extent do your assessment tasks encourage regular study in and out of class and deep rather than surface learning?	Weekly sessions built on out of class work and thus encouraged students to complete these to ensure they got more out of the weekly sessions. Employer led conference helped student motivation and through this, encouraged deeper learning.
Deliver high quality feedback information that helps learners self-correct.	What kind of teacher feedback do you provide – in what ways does it help students self-assess and self-correct?	Several feed forward opportunities built in such a feedback on title, abstract and draft poster.
Provide opportunities to act on feedback (to close any gap between current and desired performance)	To what extent is feedback attended to and acted upon by students in your course, and if so, in what ways?	Feedback on draft poster used to produce final poster providing good incentive to use it. Poster title feedback needed revised new title in some cases, encouraging its use.
Ensure that summative assessment has a positive impact on learning?	To what extent are your summative and formative assessments aligned and support the development of valued qualities, skills and understanding.	Summative assessment aligned with developing research and technical authoring skills and expertise, valued as graduate attributes by students and employers.
Encourage interaction and dialogue around learning (peer and teacher-student).	What opportunities are there for feedback dialogue (peer and/or tutor-student) around assessment tasks in your course?	Feedback dialogue between tutors and students built in to weekly sessions on the formative assessment tasks
Facilitate the development of self-assessment and reflection in learning.	To what extent are there formal opportunities for reflection, self-assessment or peer assessment in your course?	Not addressed to a great extent although the basis is there through the use of Pebblepad, an online resource to support all student submissions/module material. Pebblepad has a number of reflective/self assessment tools built into it.
Give choice in the topic, method, criteria, weighting or timing of assessments.	To what extent do students have choice in the topics, methods, criteria, weighting and/or timing of learning and assessment tasks in your course?	Students able to select own topic. Less choice over criteria, weighting and timing.
Involve students in decision-making about assessment policy and practice.	To what extent are your students in your course kept informed or engaged in consultations regarding assessment decisions?	Student feedback from last year used to inform changes this year and discussions ongoing with students this year on how this was working.
Support the development of learning communities	To what extent do your assessments and feedback processes help support the development of learning communities?	Community encouraged through peer review and discussion opportunities and preparations for conference itself.
Encourage positive motivational beliefs and self-esteem.	To what extent do your assessments and feedback processes activate your students' motivation to learn and be successful?	Presentation at an employer led conference provides a good motivation for students to learn and be successful. Formative work aligned tightly to final summative assessment encouraging engagement with these aspects also.
Provide information to	To what extent do your	Module delivery was designed around the

teachers that can be used to help shape the teaching	assessments and feedback processes inform and shape your teaching?	assessment process to ensure material covered in logical order and provided sufficient information and practice for students to engage successfully in the various assessment stages.
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Figure 4: Alignment of Module Assessment Strategy to REAP Principles of Good Formative Assessment and Feedback.

5. EVALUATION OF APPROACH AND STUDENT FEEDBACK

In this section the results from this change of delivery and assessment practice are evaluated from the perspective of the module team and students.

5.1 Observations from the Module Team

The module team observed that during the first two sessions, student attendance was poor and the students seemed reluctant to engage with the module. However the module team 'chased' the students on their attendance and continued with their inquiry based approach during the taught sessions. By the end of the module all students seemed engaged with the module and participating in the majority of activities. There was 100% attendance at the conference itself. Also students were initially reluctant to engage in the classroom discussion but by the end of the module even the 'quieter' students were participating in the classroom based sessions and making active contributions.

All the students attended an extra session prior to the conference itself designed to do a final check on the posters before printing them. This turned into a much more social occasion than the module team had anticipated with students providing group feedback to each other on their posters. When the printer broke and required the posters to be translated into a specific pdf format, the team spirit was evidenced by the way students volunteered to stay and print each other's work out and helped each other with the pdf formatting issues.

On the day of the conference, the students turned up punctually, smartly dressed and were keen and active listeners during the various conference sessions. Their final posters and 'verbal tours' were of a high standard and employers commented on the useful and informative nature of their posters and on the day itself. Employer comments included *"Useful opportunity to meet other businesses in the area and understand how they are addressing the challenges"*. *"Very useful update on the Data Protection Act – I had not realized the size of the penalties they could impose"* clearly demonstrating that they valued the experience too. The students also contributed to the question and answer sessions at the end of each conference presentation, providing relevant and insightful comments and questions to the presenters.

In terms of acquiring technical authoring skills, the idea of presenting to a non-technical audience proved very useful. Initial titles included *"Point to point laser communication systems"*, *"Securing Data using RAID"* and *"Securing RFID Technology"*. These provided a great discussion opportunity on presenting highly technical issues to a non-technical audience. Students were asked to revisit these to ensure they used terms that would be understood by anyone. The students did not find this easy and it resulted in some animated and thoughtful discussion. For example *"Security through Virtualisation"* was revised to become *"How to achieve zero downtime"*. A similar process was required for the abstracts and draft posters where students had to investigate how to present highly technical information in simple terms.

Students were also keen to receive feedback on their final assessment with over 90% attendance at the 'optional' session arranged for this. This contrasted with the previous year where students wanted to see their marks but did not seem interested in the tutor feedback and comments.

5.2 Student Feedback

Student feedback on the module showed that all of the students were satisfied with the quality of the module. The students were asked to identify what they particularly liked about the module. The following aspects were highlighted:-

- Developed good presentation and poster skills
- Useful skills on presenting technical information
- Useful experience to present to employers and will be useful later when seeking employment

- Participating in the conference itself. The sessions themselves were useful and interesting.

Other comments included *'it was different ... and gave me the change to research something I am interested in', 'I really enjoyed the module and always looked forward to Wednesday mornings'*. One interesting comment from a student was that they liked the 'discussion lectures'. This new term nicely sums up the active learning approach the module team adopted to presenting material in the weekly sessions.

Students made the following observations for improvements to the module. Several students identified that no improvements were needed. Others would have liked a practice presentation. This comment was interesting given an opportunity for a practice presentation was made available to students for this delivery but no student took this up. The timing of this may have been too early in the module. Other suggestions included being able to view posters from previous cohorts and attending another conference earlier in the module to gain a better idea of what to expect on the conference day itself.

All of the students were positive about linking the final assessment to a conference aimed at employers from industry, business and local government. Students identified the following benefits from this aspect: *"it will show people from different parts of the industry what we have done", "some of the delegates will have learned more about security from our posters", "having a context for the presentation was very helpful as it enabled me to plan accordingly"* However students also commented that not all of the delegates seemed interested in their posters and they would have welcomed more feedback on their posters from the conference delegates.

5.3 Final Reflections and Evaluation

The changes to the module delivery to a more inquiry based active learning approach have resulted in greater motivation and engagement by the students. The final posters were of a very high quality and clearly showed that the students understood the assessment requirements and had presented highly technical information in a manner and format that was accessible to a non technical audience. The content and structure of the posters were also very good and generally showed a very good understanding of technical authoring concepts and ideas.

The changes to the assessment process including the formative stages also resulted in strong engagement from the students. Providing a more authentic conference experience proved very useful and ensured that students produced work to a highly professional standard. A number of students were apprehensive about the 'verbal tours' of the posters they had been asked to do, but on the day, they presented clearly and with confidence, responding well to questions and showing on the whole that they had researched their chosen topic well and had a good technical understanding of the subject content of their poster.

Students welcomed the module delivery and assessment strategy and were generally positive in their feedback. A number of suggestions were made for further developments including experience of attending another conference prior to the actual conference, access to posters from previous cohorts, practice session for the verbal tours. The module team is generally pleased with the new approach and is intending to use this for future deliveries. One area for review will be the format and focus of the conference itself. Because the conference provided an output for students from several programmes, there were a large number of posters on view. This was highlighted by students as a reason why the conference delegates (25 in total) did not view all the posters. It would be useful to look at the format to ensure that each student receives some external feedback on their poster.

The module team will continue to taken an action research based approach to the module delivery, reviewing this current delivery in light of the student and tutor feedback, planning for the next delivery and implementing and reflecting once again.

6. SUMMARY AND CONCLUSIONS

This study reports the findings from an action research based study to investigate providing more engaging delivery and authentic assessment strategy to a technical authoring module. Basing the delivery on a research based and research tutored approach has led to better participation by the students and final student work that is of a high quality and that clearly demonstrates students have a good understanding of technical authoring concepts and skills. Taking a more authentic assessment process through the use of an employer conference also helped with student motivation and engagement and provided a realism and professionalism that would not have been possible through a more conventional assessment strategy. Other benefits included a greater sense of community within the student body, and individually students gained in confidence both through the conference presentation and also by attending the conference itself. Student feedback was positive and constructive.

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